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Spiders of the Genus *Cyclosa* (Araneae, Araneidae) from Taiwan¹⁾

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Abstract Eleven species of the spider genus *Cyclosa* are reported from Taiwan. Of these, *Cyclosa quinqueguttata* (THORELL, 1881) originally described from Burma is recorded for the first time from Taiwan. *Cyclosa fissicauda* described by SIMON (1889) from the Himalayas is newly synonymized with *C. quinqueguttata*. Previous records of *Cyclosa insulana* (COSTA, 1834) are revised with the materials newly obtained. These are identified with *C. confusa* BÖSENBERG et STRAND, 1906, and *C. omonaga* TANIKAWA, 1992, both new to the Taiwanese fauna. Four new species are described under the names, *Cyclosa formosana*, *argentata*, *shinoharai* and *koi*.

Up to the present, 14 species of the spider genus *Cyclosa* were recorded from Taiwan, that is, *C. conica* (PALLAS, 1772), *ginnaga* YAGINUMA, 1959, *insulana* (COSTA, 1834), *argenteoalba* BÖSENBERG et STRAND, 1906, *japonica* BÖS. et STR., 1906, *laticauda* BÖS. et STR., 1906, *monticola* BÖS. et STR., 1906, *octotuberculata* KARSCH, 1879, *sedeculata* KARSCH, 1879, *mulmeinensis* (THORELL, 1887), *vallata* (KEYSERLING, 1886), *bicauda* SAITO, 1933, *spinosa* SAITO, 1933, and *tricauda* SAITO, 1933 [SAITO (1933), LEE (1964), SHIMOJANA (1967), NAKAHIRA (1969), CHU & OKUMA (1970, 1975), TANIKAWA (1992)].

Of these, three species described by SAITO (1933) are doubtful in their systematic position. The present authors agree with YOSHIDA (1978), who pointed out that *C. spinosa* should belong to the genus *Arachnula* and that *C. bicauda* is probably the same as *Cyrtophora exanthematica*. Though his original figures of *C. tricauda* suggest its attribution to *Cyclosa*, SAITO described that the median ocular area of the species is distinctly narrower in front than behind, contrary to the fact that the area is much wider in front in all the known species of *Cyclosa*. However, the authors cannot

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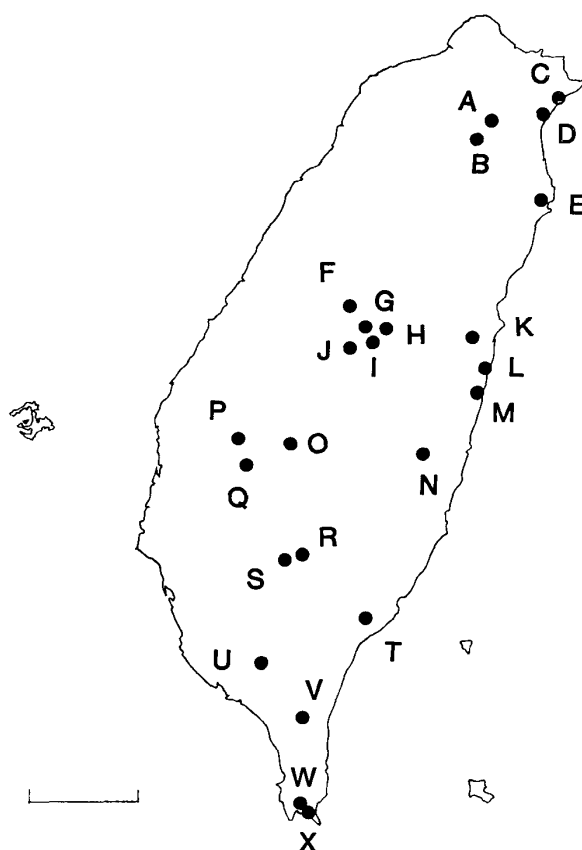


Fig. 1. Collecting sites in Taiwan. — Taipei Hsien: A, Huoshao-chang, B, Wulai; Iran Hsien: C, Tali, D, Kueishan, E, Suao; Taichung Hsien: F, Mt. Pahsien-shan; Nant'ou Hsien: G, Mt. Howang-shan, H, Wushe, I, Nanshan-hsi, J, Jihyueh-t'an; Hualien Hsien: K, T'ungmen, L, Fute, M, Shuilien, N, Hungyeh-Wench'uan; Chiai Hsien: O, Alishan, P, Chiai-shih; Tainan Hsien: Q, Kuantzuling; Kaohsiung Hsien: R, Mt. Hsien-shan, S, Mt. T'engchih; Taitung Hsien: T, Chipen-Wench'uan; Pingtung Hsien: U, Fengt'ien, V, Shouk'a, W, Mt. Nanjen-shan, X, Kenting. (Scale: 50 km.)

decide their opinion, since the type specimens of these spiders cannot be located.

The first author has clarified that *C. insulana* is an European species and does not occur in Asia, though many authors recorded it from Japan (TANIKAWA, 1992). Having examined many specimens doubtfully identified with *C. insulana*, he recognized two species, *Cyclosa confusa* BÖSENBERG et STRAND, 1906, and *C. omonaga* TANIKAWA, 1992, instead of *C. insulana*. Though "*C. insulana*" was also recorded by many authors, the present study has revealed that only *C. confusa* and *C. omonaga* are actually distributed in Taiwan.

More than 70 specimens of the spider genus *Cyclosa* were obtained through the field research of the zoological expeditions to Taiwan made by the National Science Museum, Tokyo (1989–1991). On the other hand, a small collection of the *Cyclosa* spiders from Taiwan was submitted to the first author for study by Dr. C. OKUMA,

Kyushu University. After an examination of these specimens, the authors have recognized 11 species, of which seven are newly recorded to the Taiwanese fauna, including four new ones.

All the type specimens of the new species to be described in this paper are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo.

The following abbreviations are used: MOA, median ocular area; PME, posterior median eye.

Before going further, the authors wish to express their hearty thanks to Professor Yau-I CHU and Mr. Chiun-cheng KO, Taipei, and Dr. Akihiko SHINOHARA, Tokyo, for their kind collaboration, and to Dr. Chiyoko OKUMA, Fukuoka, Dr. Paul HILLYARD, London, and Mr. Kiyoshi NAKAHIRA, Kochi, for their offering or loaning invaluable specimens and for kind advice. Sincere thanks are also due to Dr. Shun-ichi UENO, Tokyo, for critical reading of the manuscript of this paper.

Family Araneidae

Genus *Cyclosa* MENGE, 1866

Cyclosa omonaga TANIKAWA, 1992

Cyclosa insulana: BÖSENBERG & STRAND, 1906, p. 205, pl. 4, fig. 22, pl. 11, figs. 243–244, pl. 15, fig. 396. — S. SAITO, 1959, p. 99, pl. 14, fig. 113, pl. 16, fig. 113 (partim). — LEE, 1964, p. 52 (partim). — SHIMOJANA, 1967, p. 22 (partim). — YAGINUMA, 1968, p. 68, pl. 31, fig. 169 (partim); 1986, p. 121, fig. 64, pl. 34, fig. 6 (partim). — NAKAHIRA, 1969, p. 27 (partim). — CHU & OKUMA, 1975, p. 46 (partim). — CHIKUNI, 1989, pp. 84, 218, fig. 68 (partim: female). [Nec *C. insulana* (COSTA, 1834).]

Cyclosa omonaga TANIKAWA, 1992, p. 30, figs. 44–55, 97, 108 [holotype ♂ and allotype ♀ from Higa-shitaichi, Tamano-shi, Okayama Pref., Japan, 26–VIII–1991, A. TANIKAWA leg., paratypes 4 ♀ 4 ♂ from Mie, Wakayama, Okayama and Fukuoka Prefectures, Japan, deposited in the National Science Museum (Nat. Hist.), Tokyo, examined].

Specimens examined. 1 ♀, Kueishan, 120 m alt., Ilan Hsien, 18–III–1991, H. ONO leg. (NSMT–Ar 2499); 3 ♀, 12–X–1989, Wulai, Taipei Hsien, H. ONO leg. (NSMT–Ar 2500); 3 ♀, Jihyueh-t'an, Tehua-she, 850 m alt., Nant'ou Hsien, 3–III–1991, H. ONO leg. (NSMT–Ar 2971); 3 ♀ 1 ♂, Hungyeh-Wench'uan, 240–300 m alt., Hualien Hsien, 20–III–1991, H. ONO leg. (NSMT–Ar 2972–2973); 1 ♂, Kuantzuling, Tainan Hsien, 24–V–1971, K. KANMIYA leg. (Coll. C. OKUMA); 1 ♀, Mt. T'engchih, 1,550 m alt., Paoshan-ts'un, T'aoyuan-hsiang, Kaohsiung Hsien, 30–X–1989, T. YAMASAKI leg. (NSMT–Ar 2974); 1 ♀, Chipen-wench'uan, 200 m alt., Taitung Hsien, 23–III–1991, H. ONO leg. (NSMT–Ar 2975); 2 ♀, Fengt'ien, Pingtung Hsien, 12–IV–?, Yau-I CHU leg. (Coll. OKUMA).

Remarks. This species has been misidentified with *Cyclosa insulana* COSTA, 1834, by previous authors (LEE, 1964; SHIMOJANA, 1967; NAKAHIRA, 1969; CHU & OKUMA, 1975). TANIKAWA (1992) reported that *C. insulana* previously recorded from Japan included two species, *C. omonaga* and *C. confusa*, and true *C. insulana* did not

occur in Asia.

Distribution. Japan, Taiwan.

Cyclosa confusa BÖSENBERG et STRAND, 1906

Cyclosa confusa BÖSENBERG et STRAND, 1906, p. 209, pl. 15, fig. 418 [holotype ♂ from Japan, 1882, W. DÖNITZ leg., deposited in Senckenberg Museum, Frankfurt am Main, examined]. — ZHU, 1983, p. 28. — TANIKAWA, 1992, p. 34, figs. 65–80, 98, 108.

Cyclosa insulana: S. SAITO, 1959, p. 99, pl. 14, fig. 113, pl. 16, fig. 113 (partim). — LEE, 1964, p. 52 (partim). — SHIMOJANA, 1967, p. 22 (partim). — YAGINUMA, 1968, p. 68, pl. 31, fig. 169 (partim); 1986, p. 121, fig. 64, pl. 34, fig. 6 (partim). — NAKAHIRA, 1969, p. 27 (partim). — CHU & OKUMA, 1975, p. 46 (partim). — CHIKUNI, 1989, pp. 84, 218, fig. 68 (partim: male). [Nec *C. insulana* (COSTA, 1834).]

Specimens examined. 1 ♀, Huoshao-chang, Taipei Hsien, V–1969, Yau-I CHU leg. (Coll. C. OKUMA); 1 ♀, Tali, seashore, Ilan Hsien, 17–III–1991, H. ONO leg. (NSMT–Ar 2976); 4 ♀, T'ienkung-miao, Tali, 30 m alt., Ilan Hsien, 17–III–1991, H. ONO leg. (NSMT–Ar 2977); 12 ♀ 2 ♂, Kueishan, 120 m alt., Ilan Hsien, 18–III–1991, H. ONO leg. (NSMT–Ar 2978–2979); 1 ♀, Suao, Ilan Hsien, 29–V–1969 (Coll. C. OKUMA); 2 ♀, Wushe, Nant'ou Hsien, 4–IV–? (Coll. C. OKUMA); 5 ♀ 1 ♂, Shuilien, seashore, Hualien Hsien, 19–III–1991, H. ONO leg. (NSMT–Ar 2980); 2 ♀, Shanghsik'ou, Chiai-shih, Chiai Hsien, 26–IV–? (Coll. C. OKUMA); 2 ♀, Hsinan-shan, S slope, 1,800–2,300 m alt., 31–X–1989, H. ONO leg. (NSMT–Ar 2981); 1 ♀, Mt. T'engchih, 1,550 m alt., Paoshan-ts'un, T'aoyuan-hsiang, Kaohsiung Hsien, 31–X–1989, H. ONO leg. (NSMT–Ar 2982); 1 ♀, Shouk'a, 400 m alt., Pingtung Hsien, 21–III–1991, H. ONO leg. (NSMT–Ar 2983); 1 ♀, Mt. Nanjen-shan, 280 m alt., Pingtung Hsien, 22–III–1991, H. ONO leg. (NSMT–Ar 2984).

Remarks. This species has also been misidentified with *Cyclosa insulana* (COSTA, 1834), by previous authors (LEE, 1964; SHIMOJANA, 1967; NAKAHIRA, 1969; CHU & OKUMA, 1975).

Distribution. Japan, China, Taiwan.

Cyclosa mulmeinensis (THORELL, 1887)

Epeira mulmeinensis THORELL, 1887, p. 221 [syntypes (females) from India, deposited in Museo Civico di Storia Naturale, Genova, not examined]; 1895, p. 192. — WORKMAN, 1896, p. 37, pl. 37.

Cyclosa mulmeinensis: SIMON, 1908, p. 104. — CHRYSANTHUS, 1961, p. 203, figs. 34–36; 1971, pp. 23, 25, figs. 120–122. — SHIMOJANA, 1963, p. 29; 1967, p. 22. — LEE, 1964, p. 50, figs. 16 c–e. — YAGINUMA, 1967, p. 95, fig. 2; 1968, p. 129, fig. 106; 1986, p. 121, fig. 64, pl. 34, fig. 5. — NAKAHIRA, 1969, p. 27. — CHU & OKUMA, 1970, p. 71; 1975, p. 46. — TIKADER, 1982, p. 187, figs. 356–360. — ROBERTS, 1983, p. 258, 261, figs. 155–157. — ZHU, 1983, p. 29. — CHIKUNI, 1989, pp. 85, 219, fig. 71. — TANIKAWA, 1990, p. 5, figs. 16–32; 1992, p. 54, figs. 149–165, 181.

Argyrodes longispinus SAITO, 1933, p. 45, pl. 3, fig. 26 [type depository unknown], synonymized by YAGINUMA (1967).

Specimens examined. 1 ♀, T'ungmen, 250 m alt., 15 km SW of Hualien, Hualien

Hsien, 20–III–1991, H. ONO leg. (NSMT–Ar 2985); 4 ♀ 1 ♂, Fute, seashore, Hualien Hsien, 19–III–1991, H. ONO leg. (NSMT–Ar 2986).

Distribution. Africa to East Asia (Japan, Taiwan).

Cyclosa vallata (KEYSERLING, 1886)

Epeira vallata KEYSERLING, 1886, p. 149, pl. 12, fig. 5 [11 ♀ syntypes from Rhockhampton, Queensland, Australia, deposited in Zoologisches Museum, Universität Hamburg, examined].

Cyclosa vallata: BÖSENBERG & STRAND, 1906, p. 203, pl. 15, fig. 411. — LEE, 1964, p. 50, fig. 16 g. — YAGINUMA, 1968, p. 68, pl. 31, fig. 172; 1986, p. 121, fig. 64, pl. 34, fig. 4. — CHRYSANTHUS, 1971, pp. 23, 25, figs. 40–41, 117–119. — CHU & OKUMA, 1975, p. 47. — ZHU, 1983, p. 30. — PAIK & KIM, 1985, p. 63. — CHIKUNI, 1989, pp. 85, 219, fig. 72. — TANIKAWA, 1990, p. 2, figs. 1–15; 1992, p. 57, figs. 166–181.

Specimen examined. 1 ♂, Shuilien, seashore, Hualien Hsien, 19–III–1991, H. ONO leg. (NSMT–Ar 2987).

Distribution. Japan, Korea, Taiwan, New Guinea, Australia.

Cyclosa quinqueguttata (THORELL, 1881)

(Figs. 2–5)

Epeira quinque-guttata THORELL, 1881, pp. 112, 688 [holotype ♂ from Tharawaddy, Burma, OATES leg., deposited in the British Museum of Natural History, London, examined]; 1895, p. 195.

Epeira hybophora THORELL, 1887, p. 217 [syntypes (females and juveniles) from Burma and India, FEA, BECCARI, and D'ALBERTIS leg., deposited in Museo Civico di Storia Naturale, Genova, not examined]; 1895, p. 192; synonymized by ROBERTS (1983).

Cyclosa hybophora: SIMON, 1895, p. 780. — THORELL, 1898, p. 353.

Cyclosa quinqueguttata: ROEWER, 1942, p. 758. — ROBERTS, 1983, p. 261, figs. 155–157. — TANIKAWA, 1992, p. 61, figs. 190–197.

Cyclosa fissicauda SIMON, 1889, p. 337 [holotype ♀ from the Himalayas, deposited in Indian Museum (?), not examined]. — TIKADER, 1982, p. 189, figs. 361–366. [Syn. nov.]

Specimens examined. 1 ♂, Nanshan-hsi, 860 m alt., Nant'ou Hsien, 15–III–1991, H. ONO leg. (NSMT–Ar 2988); 14 ♀, Tharawaddy, Burma, OATES leg. [labeled *C. hybophora*, deposited in the British Museum (Natural History)]; 16 ♀ 3 ♂, Tongsa-Shemgang, Bhutan, 28–VII–1990, A. TANIKAWA leg. (Coll. A. TANIKAWA).

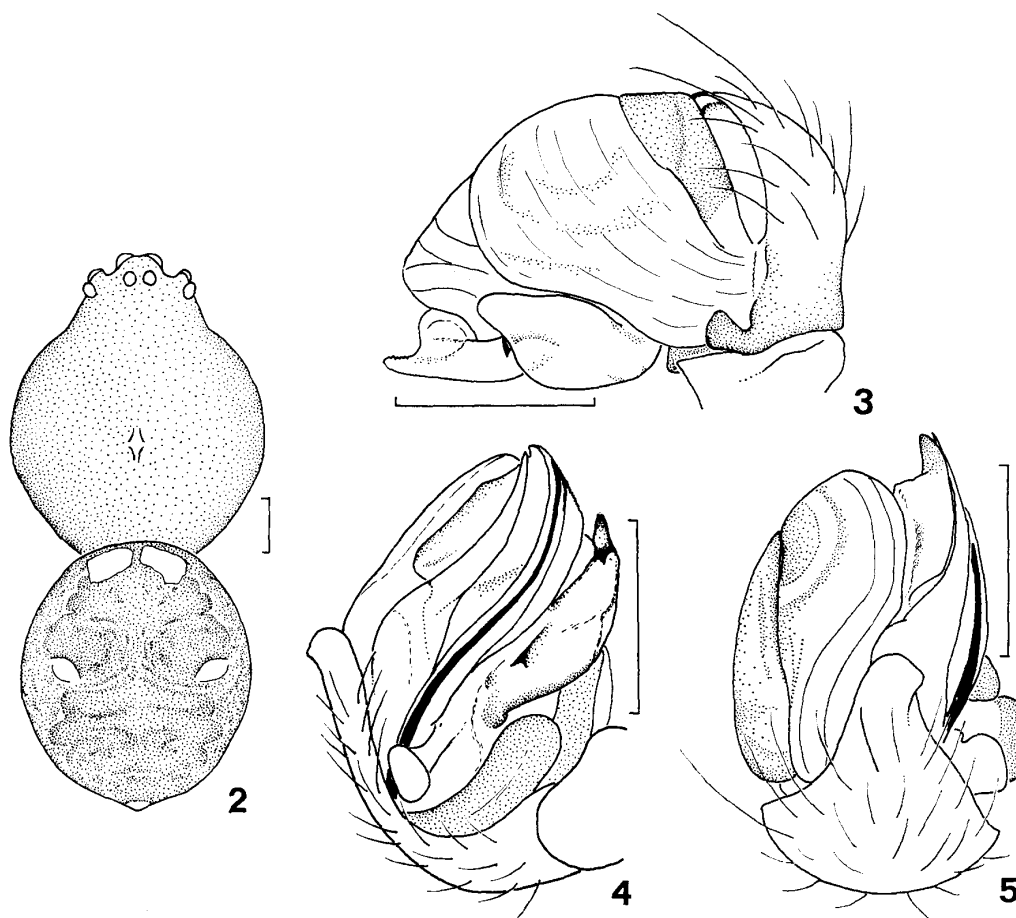
Notes. Though the type specimen of *Cyclosa fissicauda* SIMON, 1889, was not available, the first author considered that the species should be a junior synonym of *C. quinqueguttata*. The specimens of *C. quinqueguttata* collected in Burma, Bhutan and Taiwan exactly agree with the descriptions of *C. fissicauda* made by SIMON (1889) and TIKADER (1982).

Description [based on 1 ♂ from Taiwan]. Measurement (in mm). Body length 2.56; carapace length 1.38, width 1.13; abdomen length 1.22, width 1.02. Length of legs as shown in Table 1.

Carapace length/width 1.22; MOA length/width 1.04, anterior width/posterior width 1.25. Labium length/width 0.46; sternum length/width 1.09. Length of leg

Table 1. Measurement of leg segments of *Cyclosa quinqueguttata* (THORELL, 1881) (in mm; ♂).

Leg	Tarsus	Metatarsus	Tibia	Patella	Femur	Total
I	0.40	0.67	0.70	0.45	1.09	3.31
II	0.36	0.63	0.53	0.43	1.01	2.96
III	0.30	0.38	0.31	0.28	0.66	1.93
IV	0.34	0.67	0.65	0.39	1.06	3.11



Figs. 2–5. *Cyclosa quinqueguttata* (THORELL, 1881). — 2. Cephalothorax and abdomen of male, dorsal view. 3. Male palp, retrolateral view. 4. Same, prolateral view. 5. Same, axial view. (Scales: 0.25 mm.)

I/carapace 2.41; femur I distally with a row of short, retrolateral spines. Male palp (Figs. 3–5): median apophysis with two small teeth (Fig. 4); embolus filiform, wrapped in an edge of conductor (Fig. 4); paramedian apophysis visible in prolateral view (Fig. 4). Abdomen length/width 1.20.

Coloration and markings. Carapace dark brown, abdomen blackish brown with black markings and five white spots (Fig. 2).

Distribution. Burma, India, Bhutan, Taiwan (new record).

Cyclosa argenteoalba BÖSENBERG et STRAND, 1906

Cyclosa argenteoalba BÖSENBERG et STRAND, 1906, p. 202, pl. 4, fig. 38, pl. 15, fig. 419 [♀ holotype from "Yunohama Berge," Saga, Japan, 1882, W. DÖNITZ leg., deposited in Senckenberg Museum, Frankfurt am Main, examined]. — SHIMOJANA, 1967, p. 22. — YAGINUMA, 1968, p. 68, pl. 31, fig. 170; 1986, p. 121, fig. 64, pl. 34, fig. 2. — NAKAHIRA, 1969, p. 27. — CHU & OKUMA, 1975, p. 45. — ZHU, 1983, p. 28. — PAIK & KIM, 1985, p. 63. — CHIKUNI, 1989, pp. 86, 219, fig. 73. — TANIKAWA, 1992, p. 65, figs. 211–221.

Specimens examined. 1 ♀, Jihyueh-t'an, Tehua-she, 850 m alt., Nant'ou Hsien, 3–III–1991, H. ONO leg. (NSMT–Ar 2989); 8 ♀, Mt. Hsinan-shan, south slope, 1,860–2,350 m, Kaohsiung Hsien, 31–X–1989, H. ONO leg. (NSMT–Ar 2990–2991); 1 ♀ 1 ♂, Mt. T'engchih-shan 1,804 m, 1–XI–1989, H. ONO leg. (NSMT–Ar 2992).

Distribution. Japan, Korea, China, Taiwan.

Cyclosa ginnaga YAGINUMA, 1959

Cyclosa ginnaga YAGINUMA, 1959, p. 12, pl. 6, figs. 8–13 [♀ holotype and paratype 1 ♀ from Kogawaguchi-Tado, Wakayama Pref., Japan, 30–VII–1951, T. YAGINUMA leg., deposited in the Arachnological Society of Japan, Otemon Gakuin University, Osaka, examined]; 1968, p. 67, fig. 63, pl. 30, fig. 166; 1986, p. 121, fig. 64, pl. 34, fig. 1. — LEE, 1964, p. 52. — SHIMOJANA, 1967, p. 22. — CHU & OKUMA, 1975, p. 46. — ZHU, 1983, p. 28. — PAIK & KIM, 1985, p. 63. — TANIKAWA, 1992, p. 71, figs. 232–246, 257.

Specimens examined. 1 ♀, Hungyeh-Wench'uan, 240–300 m alt., Hualien Hsien, 20–III–1991, H. ONO leg. (NSMT–Ar 2993); 1 ♀, Mt. Nanjen-shan, 280 m alt., Pingtung Hsien, 22–III–1991, H. ONO leg. (NSMT–Ar 2994).

Distribution. Japan, Korea, China, Taiwan.

Cyclosa formosana sp. nov.

(Figs. 6–9)

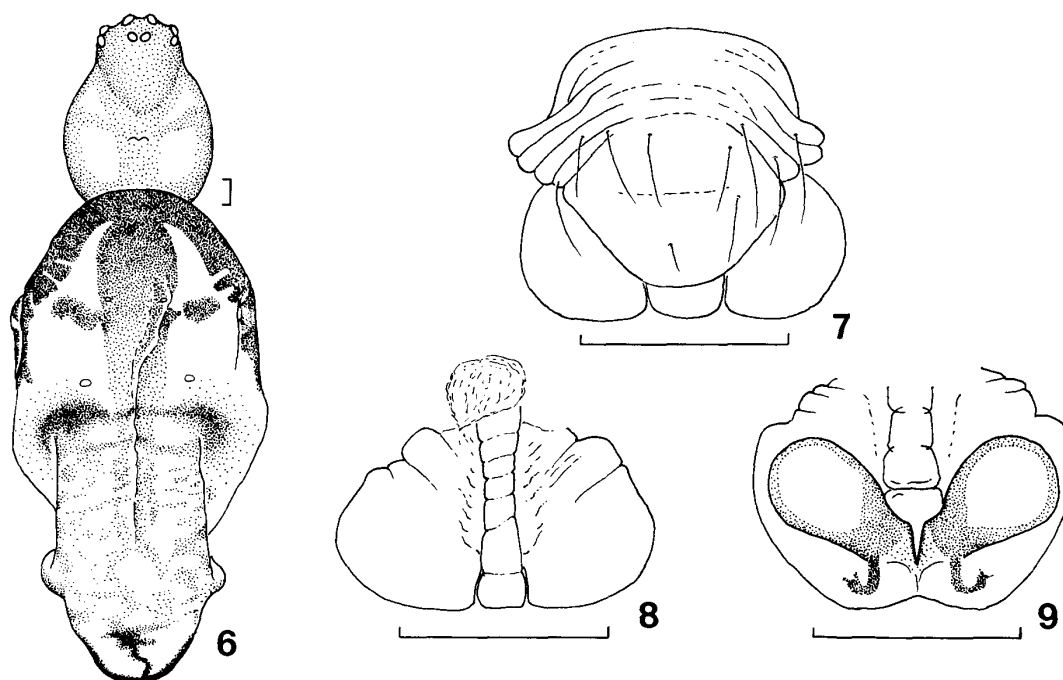
Specimens examined. Type series. Holotype: ♀, Alishan, 2,160 m alt., Chiai Hsien, Taiwan, 7–III–1991, H. ONO leg. (NSMT–Ar 2995); paratypes: 1 ♀, same data as for the holotype (NSMT–Ar 2996); 1 ♀, Mt. Pahsien-shan, near Kukuan, Taichung Hsien, 29–V–1971, K. KANMIYA leg. (NSMT–Ar 2997); 2 ♀, Alishan, Chiai Hsien, 26–V–1971, K. KANMIYA leg. (NSMT–Ar 2998).

Description [based on the holotype ♀; variations are given in parentheses; ♂ unknown]. Measurement (in mm). Body length 6.67 (5.27–6.67); carapace length 1.86 (1.69–1.86), width 1.40 (1.24–1.40); abdomen length 4.65 (3.40–4.65), width 2.40 (1.92–2.40). Length of legs of the holotype as shown in Table 2.

Carapace length/width 1.33 (1.33–1.41); MOA length/width 0.95 (0.95–1.00), anterior width/posterior width 1.31 (1.23–1.33). Chelicera with 4 (3–4) promarginal and 3 (3–4) retromarginal teeth. Labium length/width 0.64 (0.48–0.68); sternum

Table 2. Measurement of leg segments of *Cyclosa formosana* sp. nov. (in mm; ♀).

Leg	Tarsus	Metatarsus	Tibia	Patella	Femur	Total
I	0.61	1.23	1.31	0.75	1.82	5.72
II	0.60	1.15	1.20	0.72	1.61	5.28
III	0.47	0.71	0.69	0.49	1.13	3.49
IV	0.55	1.15	1.22	0.64	1.73	5.29



Figs. 6–9. *Cyclosa formosana* sp. nov. — 6. Cephalothorax and abdomen of female, dorsal view. 7. Epigynum with scape. 8. Epigynum, without scape. 9. Female genitalia, dorsal view. (Scales: 0.25 mm.)

length/width 1.19 (1.15–1.19). Length of leg I/carapace 3.07 (2.93–3.20). Abdomen length/width 2.06 (1.44–2.09), with a pair of small lateral tubercles at about 1/4 from the posterior end (Fig. 6). Female genitalia (Figs. 7–9): scape wide and somewhat wrinkled (Fig. 7); internal genitalia as shown in Fig. 9.

Coloration and markings. Carapace dark brown with light coloured markings (Fig. 6). Abdomen silver with black markings (Fig. 6).

Remarks. This species resembles *Cyclosa kumadai* TANIKAWA, 1992, but can be distinguished from the latter by the shape of epigynum (Figs. 7–8; TANIKAWA, 1992, figs. 250–252).

Etymology. The specific name is derived from an alias of the native country of the species.

Cyclosa argentata sp. nov.

(Figs. 10–12)

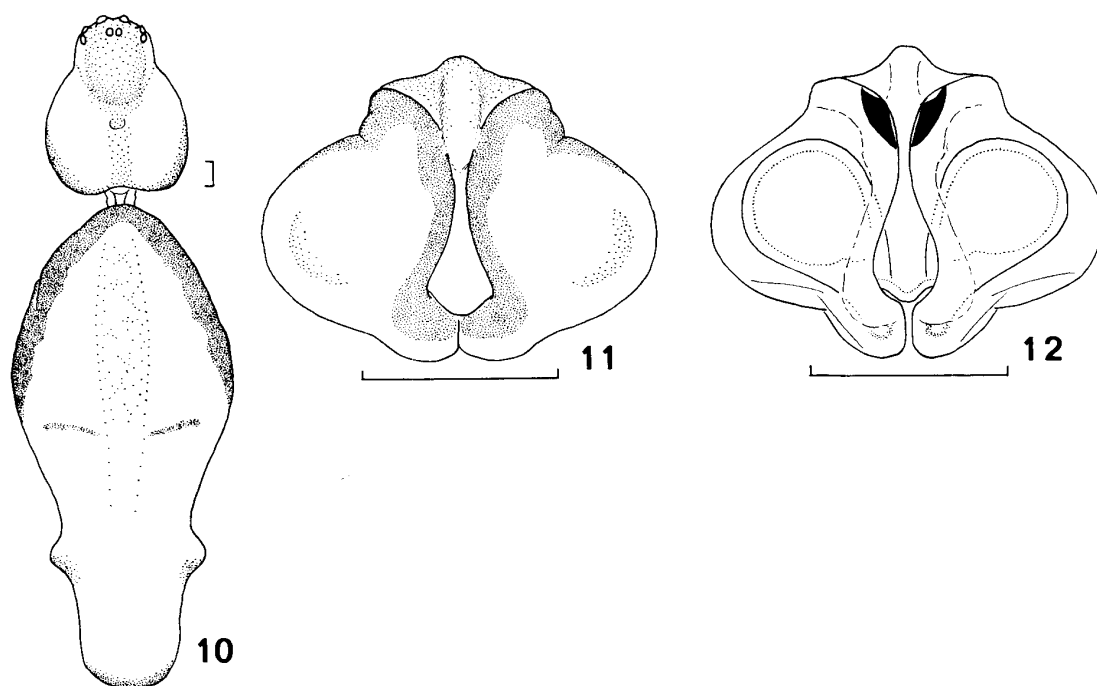
Specimen examined. Holotype: ♀, Kueishan, 120 m alt., Ilan Hsien, Taiwan, 18–III–1991, H. ONO leg. (NSMT–Ar 2999).

Description [based on the holotype ♀; ♂ unknown]. Measurement (in mm). Body length 7.20; carapace length 1.84, width 1.46; abdomen length 5.27, width 2.27. Length of legs of the holotype as shown in Table 3.

Carapace length/width 1.26; MOA length/width 0.96, anterior width/posterior width 1.32. Chelicera with 4 promarginal and 3 retromarginal teeth. Labium length/width 1.29; sternum length/width 1.12. Length of leg I/carapace 3.18. Abdomen length/width 2.32, with a pair of small lateral tubercles at about 1/4 from the posterior end (Fig. 10). Female genitalia (Figs. 11–12): scape lost; internal genitalia as shown in Fig. 12.

Table 3. Measurement of leg segments of *Cyclosa argentata* sp. nov. (in mm; ♀).

Leg	Tarsus	Metatarsus	Tibia	Patella	Femur	Total
I	0.61	1.32	1.34	0.78	1.80	5.85
II	0.59	1.22	1.20	0.72	1.66	5.39
III	0.48	0.78	0.74	0.50	1.18	3.68
IV	0.55	1.28	1.30	0.68	1.81	5.62



Figs. 10–12. *Cyclosa argentata* sp. nov. — 10. Cephalothorax and abdomen of female, dorsal view. 11. Epigynum, without scape. 12. Female genitalia, ventral view. (Scales: 0.25 mm.)

Coloration and markings. Carapace pale brown, head dark brown, thorax margined with dark brown (Fig. 10). Abdomen silvery with black markings (Fig. 10).

Remarks. This species resembles *Cyclosa ginnaga* YAGINUMA, 1959, but can be separated from the latter by the shape of epigynum (Fig. 11; TANIKAWA, 1992, fig. 240).

Etymology. The specific name is derived from the colour of the abdomen.

Cyclosa shinoharai sp. nov.

(Figs. 13–21)

Specimens examined. Type series. Holotype: ♀, Mt. Nanjen-shan, 280 m alt., Pingtung Hsien, 22–III–1991, H. ONO leg. (NSMT–Ar 3000); paratypes: 1 ♀ 1 ♂, Mt. Howang-shan, 1,800–2,000 m alt., Nant'ou Hsien, 17–III–1991, A. SHINOHARA leg. (NSMT–Ar 3001); 1 ♀, Mt. Hsinan-shan, 1,800–2,300 m, Kaohsiung Hsien, 31–X–1989, H. ONO leg. (NSMT–Ar 3002); 3 ♂, Kenting, Pingtung Hsien, 24–IV–1971, Yau-I CHU leg. (NSMT–Ar 3003).

Description [based on the holotype ♀ and the paratype ♂ from Mt. Howang-shan; variations are given in parentheses]. Measurement (in mm). Body length ♀ 4.70 (3.95–4.70), ♂ 2.93 (2.93–3.96); carapace length ♀ 1.78 (1.50–1.78), ♂ 1.39 (1.39–1.82), width ♀ 1.28 (1.05–1.28), ♂ 1.08 (1.08–1.40); abdomen length ♀ 3.20 (2.77–3.20), ♂ 1.60 (1.60–2.20), width ♀ 1.90 (1.47–1.90), ♂ 0.96 (0.96–1.38). Length of legs of the holotype ♀ and the paratype 1 ♂ from Mt. Howang-shan as shown in Table 4.

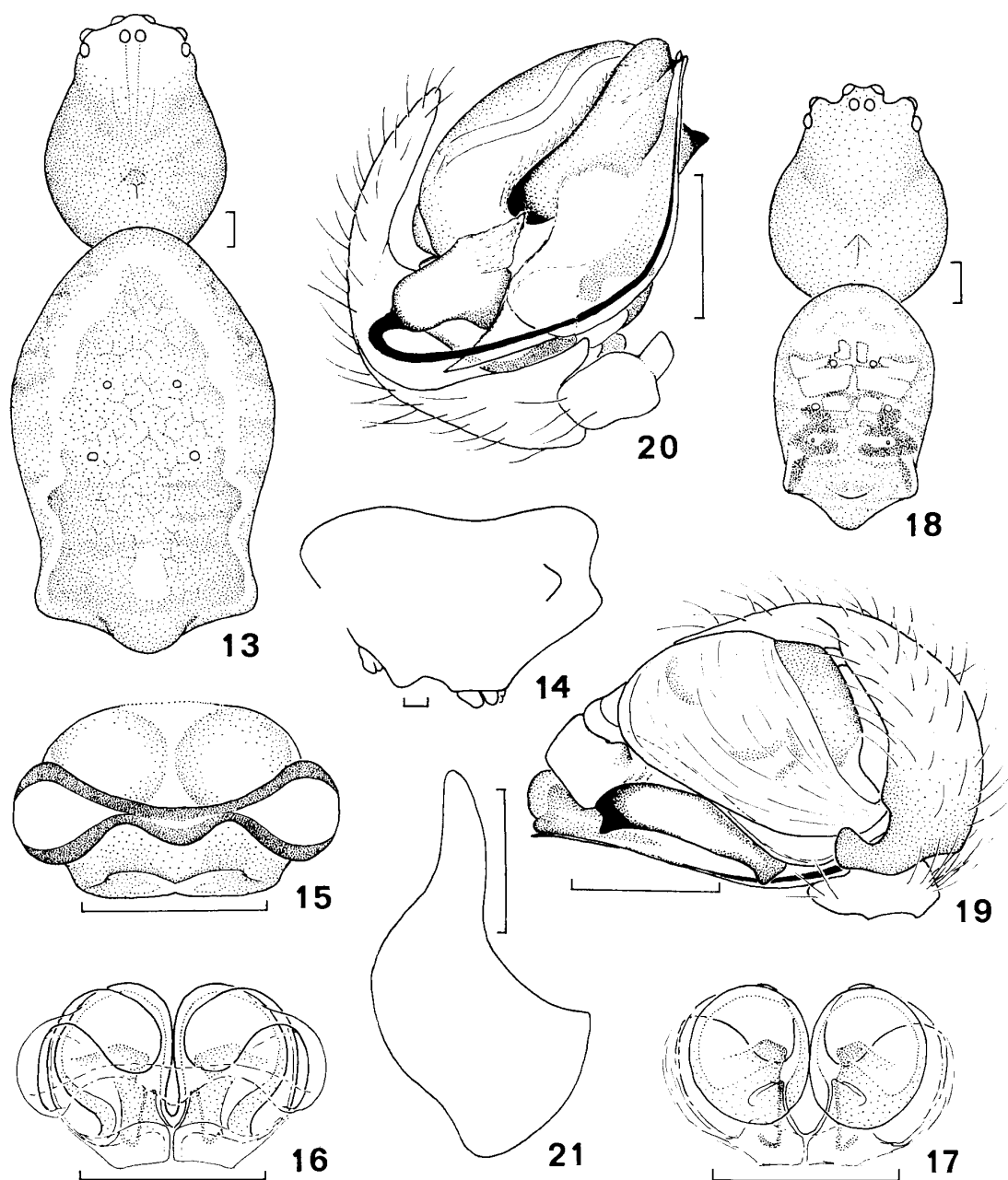
Female. Carapace length/width 1.39 (1.39–1.44); MOA length/width 0.95 (0.89–0.95), anterior width/posterior width 1.43 (1.20–1.43). Chelicera with 4 (4) promarginal and 3 (2–3) retromarginal teeth. Labium length/width 0.68 (0.63–0.68); sternum length/width 1.13 (1.13–1.15). Length of leg I/carapace 2.45 (2.25–2.45). Abdomen length/width 1.68 (1.68–1.89), with four protuberances at the posterior end (Figs. 13–14). Female genitalia (Figs. 15–17): median plate of epigynum constricted at the middle and divided into two parts, each light-coloured and teardrop-shaped (Fig. 15); scape absent (Fig. 15); internal genitalia as shown in Figs. 16–17.

Male. Carapace length/width 1.29 (1.24–1.30); MOA length/width 0.88 (0.79–0.95), anterior width/posterior width 1.23 (1.23–1.59). Chelicera with 3 teeth on the two margins, respectively. Labium length/width 0.53 (0.53–0.72); sternum length/

Table 4. Measurement of leg segments of *Cyclosa shinoharai* sp. nov. (in mm; ♀/♂).

Leg	Tarsus	Metatarsus	Tibia	Patella	Femur	Total
I	0.52/0.44	1.00/0.71	0.86/0.70	0.69/0.45	1.30/1.00	4.37/3.30
II	0.50/0.40	0.89/0.61	0.73/0.58	0.65/0.43	1.17/0.91	3.94/2.93
III	0.41/0.33	0.52/0.39	0.50/0.41	0.47/0.31	0.88/0.70	2.78/2.14
IV	0.41/0.36	0.86/0.67	0.78/0.63	0.59/0.38	1.30/1.02	3.94/3.06

width 1.03 (1.03–1.19). Length of leg I/carapace 2.38 (2.37–2.59). Retrolateral side of first femur without a row of spines. Male palp (Figs. 19–21); embolus filiform, wrapped in an edge of conductor (Fig. 20); terminal apophysis small (Fig. 20); cym-



Figs. 13–21. *Cyclosa shinoharai* sp. nov. — 13. Cephalothorax and abdomen of female, dorsal view. 14. Female abdomen, lateral view. 15. Epigynum. 16. Female genitalia, ventral view. 17. Same, dorsal view. 18. Cephalothorax and abdomen of male, dorsal view. 19. Male palp, retrolateral view. 20. Same, prolateral view. 21. Male palpal cymbium, dorsal view. (Scales: 0.25 mm.)

bium narrow (Fig. 21). Abdomen length/width 1.66, with four protuberances at the posterior end (Fig. 18).

Coloration and markings. Female. Carapace dark brown, with lighter eye area (Fig. 13) (or uniformly dark brown). Abdomen light brown, mottled with dark brown and whitish yellow (Fig. 13).

Male. Carapace dark brown (Fig. 18). Abdomen light brown, mottled with dark brown and white (Fig. 18).

Remarks. This species is closely related to *Cyclosa sedeculata* KARSCH, 1879, but can be distinguished from the latter by the following characteristics. Females: in *C. shinoharai*, PME's are closely situated (PME–PME/PME 0.42–0.90), while in *C. sedeculata*, they are more than the diameter of PME apart (PME–PME/PME 1.00–1.50); epigynum of *C. shinoharai* is furnished with a pair of teardrop-shaped light-coloured parts (Fig. 15; TANIKAWA, 1992, fig. 260). Males: the embolus of *C. shinoharai* is filiform and wrapped in an edge of the conductor (Fig. 20), while that of *C. sedeculata* is spiniform and not wrapped (TANIKAWA, 1992, fig. 264); PME's of *C. shinoharai* are closely situated (PME–PME/PME 0.42–0.67), while those of *C. sedeculata* are more than the diameter of PME apart (PME–PME/PME 1.00–1.43). This new species also resembles *Cyclosa koi* sp. nov., but can be easily separated from the latter by the shape of epigynum.

Etymology. The specific name is given after Dr. Akihiko SHINOHARA, Tokyo.

Cyclosa koi sp. nov.

(Figs. 22–25)

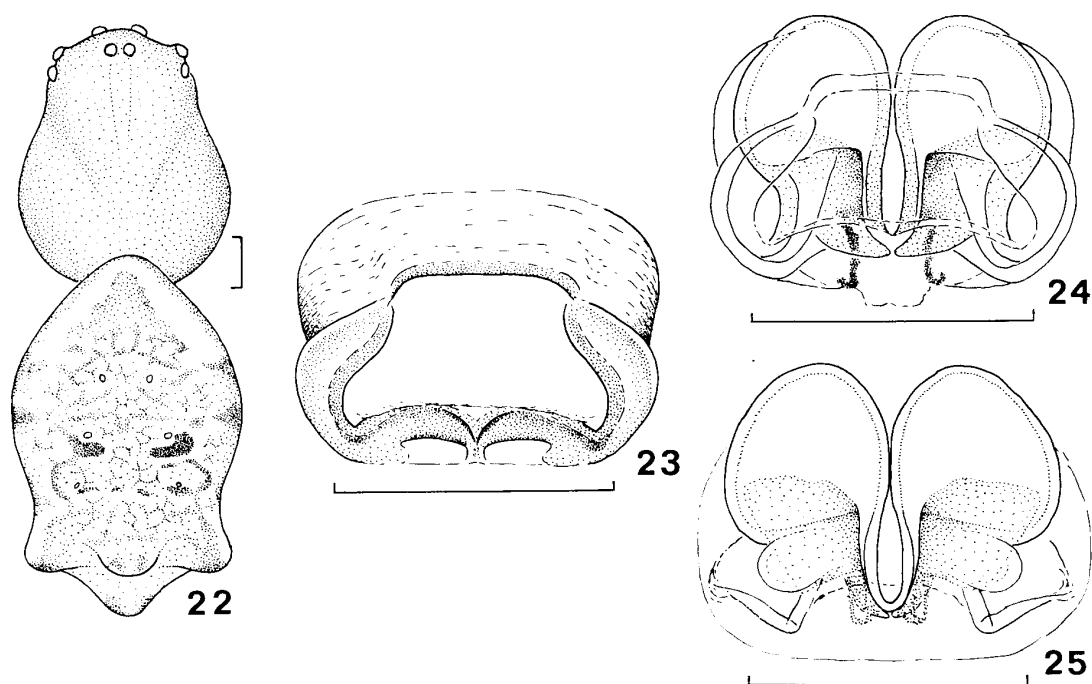
Specimen examined. Holotype: ♀, Jihyueh-t'an, Tehua-she, 850 m alt., Nant'ou Hsien, 3–III–1991, H. ONO leg. (NSMT–Ar 3004).

Description [based on the holotype ♀; ♂ unknown]. Measurement (in mm). Body length 3.18; carapace length 1.42, width 1.05; abdomen length 1.78, width 1.15. Length of legs of the holotype as shown in Table 5.

Carapace length/width 1.36; MOA length/width 0.82, anterior width/posterior width 1.31. Chelicera with 3 promarginal and 4 retromarginal teeth. Labium length/width 0.67; sternum length/width 0.95. Length of leg I/carapace 2.37. Abdomen length/width 1.56, with four protuberances at the posterior end (Fig. 22). Female genitalia (Figs. 23–25): epigynum lacking scape (Fig. 23), with trapezoidal light-coloured part (Fig. 23); internal genitalia as shown in Figs. 24–25.

Table 5. Measurement of leg segments of *Cyclosa koi* sp. nov. (in mm; ♀).

Leg	Tarsus	Metatarsus	Tibia	Patella	Femur	Total
I	0.45	0.73	0.67	0.47	1.04	3.36
II	0.44	0.63	0.57	0.45	0.89	2.98
III	0.34	0.41	0.39	0.36	0.69	2.19
IV	0.40	0.66	0.59	0.42	1.02	3.09



Figs. 22–25. *Cyclosa koi* sp. nov. — 22. Cephalothorax and abdomen of female, dorsal view. 23. Epigynum. 24. Female genitalia, ventral view. 25. Same, dorsal view. (Scales: 0.25 mm.)

Remarks. This species resembles *Cyclosa sedeculata* KARSCH, 1879, but can be distinguished from the latter by closely situated PME's (PME–PME/PME 0.5). This species also resembles *Cyclosa shinoharai* sp. nov., but can be easily distinguished from the latter by the shape of epigynum.

Etymology. This species is dedicated to Mr. Chiun-cheng KO, National Taiwan University, Taipei.

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